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CLIMATE CHANGE AND LIVELIHOOD: THE TWO SIDES OF A COIN

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ABSTRACT

The economic, social, cultural and physical environment of man is interrelated with climate change. This can be justified by several cities and people, particularly in developing countries facing alarming threats of climate change. Scholars affirmed that low or poor capacity to mitigate climate change in most developing cities would in long term swamp the natural and human capacity systems required to adapt to prevailing impacts of climate change. The impacts of climatic change on socio-economic activities have being a disturbing developmental issue for governments in developed and developing world. In Most countries climate change is a notable environmental factor that shape and re-shape sources of livelihoods. It has over time forced vast number of people into shackle of poverty through destruction of their means of livelihoods. This in recent time manifested in the lost of properties, lives, and destruction of infrastructural facilities. This paper unveiled the nexus between global climate change and livelihoods. It explored the concepts of livelihood and vulnerability in relation to climate change and its consequent impacts on livelihoods. The paper also examines the roles of governance towards adapting and mitigating the effects of climate change. It emphasized the need for improved infrastructural facilities, environmental education/ enhanced climate change awareness programme, improved and monitor physical planning activities, good/effective governance and establishment of climate change insurance scheme.

Keywords : Climate Change, livelihood, vulnerability, adaptation, mitigation and poverty

ABSTRACT

Lingkungan ekonomi, sosial, budaya dan fisik manusia saling terkait dengan perubahan iklim. Hal ini dapatterjadi di beberapa kota dan masyarakat, terutama di negara berkembang dalam menghadapi ancaman yang mengkhawatirkan tentang perubahan iklim. Para ahli menegaskan bahwa kapasitas rendah atau miskin untuk mengurangi perubahan iklim di kota-kota berkembang akan butuh waktu lama untuk beradaptasi antara sistem kapasitas alam dan manusia dengan dampak perubahan iklim yang terjadi. Dampak perubahan iklim pada kegiatan sosial ekonomi telah menjadi masalah yang mengganggu perkembangan

pemerintah di negara maju dan berkembang. Di sebagian besar negara perubahan iklim merupakan faktor lingkungan yang layak dipertimbangkan sebagai faktor pembentuk dan pembentuk kembali sumber mata pencaharian. Dalam beberapa waktu terakhir hal ini diwujudkan dalam kehilangan properti, jiwa, kerusakan infrastruktur. Makalah ini mengemukakan hubungan antara perubahan iklim global dan mata pencaharian. Hal Ini mengeksplorasi konsep penghidupan dan kerentanan dalam kaitannya dengan perubahan iklim dan dampak pada mata pencaharian. Makalah ini juga meneliti peran pemerintahan terhadap adaptasi dan mitigasi dampak perubahan iklim. Ini menekankan perlunya perbaikan fasilitas infrastruktur, pendidikan lingkungan / program kesadaran, perbaikan kegiatan pembangunan infrastruktur, pemerintahan yang baik, bersih dan pembentukan skema asuransi perubahan iklim.

Kata kunci : Perubahan Iklim, mata pencaharian, kerentanan, adaptasi, mitigasi dan kemiskinan

INTRODUCTION

Climate has been described as the average weather conditions of a place or region over a period. It includes all conditions such as winter, spring, summer, harmattan, rainfall, and also entails special events like tornadoes, floods and droughts. Stemmed on this premise, climate change is viewed as a prolonged change in the weather conditions of the globe as one entity [*Satterwaite*, 2007]. The economic, social and cultural activities of any nation or community are interdependent on physical environment, particularly the climate change. Climate change is a notable element that shape and re-shape various activities of human beings. It is imperative to note that, the extent of is impact is determined by existing or prevailing social, economic, ecological, institutional, technological and processes of governance in the society. It however goes beyond doubt that climate change can exacerbate inequalities, and vulnerability to it varies and complex. For several decades, the impacts of climatic change on livelihoods have being a disturbing issue for governments in developed and developing world. *NOAA*, [2007] emphasized that the last decade of the 20th Century and the beginning of the 21st have been the warmest period in the entire global instrumental temperature record, starting in the mid-19th century.

In developing countries including Nigeria, climate change is a threat to sustainable development. It influences health, infrastructure, settlements, food security and agriculture, forests and marine ecosystems. A notable issue in recent time is the persistent, irregularity of rainfall and intense heat effect in houses. Climate change has continuously contributed to degradation and loss of farmland, lives and properties. Painfully, climate change coupled with poor health facilities and income, increases exposure of people; especially the poor to diseases. It is imperative to note that, climate change plays a fundamental role in shaping natural ecosystem, social, economic and physical systems that depends on it. For instance, rising temperatures may bring about changes in weather condition which could lead to disastrous social, economic and environmental condition.

The paper explored the nexus between global climate change and livelihoods. The theoretical and conceptual issues on climate change, livelihoods and vulnerability were discussed. The processes and roles of governance towards mitigating the effects of climate change were elaborated. Approaches towards mitigating impacts of climate change were discussed within the realm of improved infrastructural facilities, environmental

education/ enhanced climate change awareness and preparedness programme, improved and monitor physical planning activities and effective governance.

THE METHODS

Livelihood and Vulnerability: A Theoretical Exploration

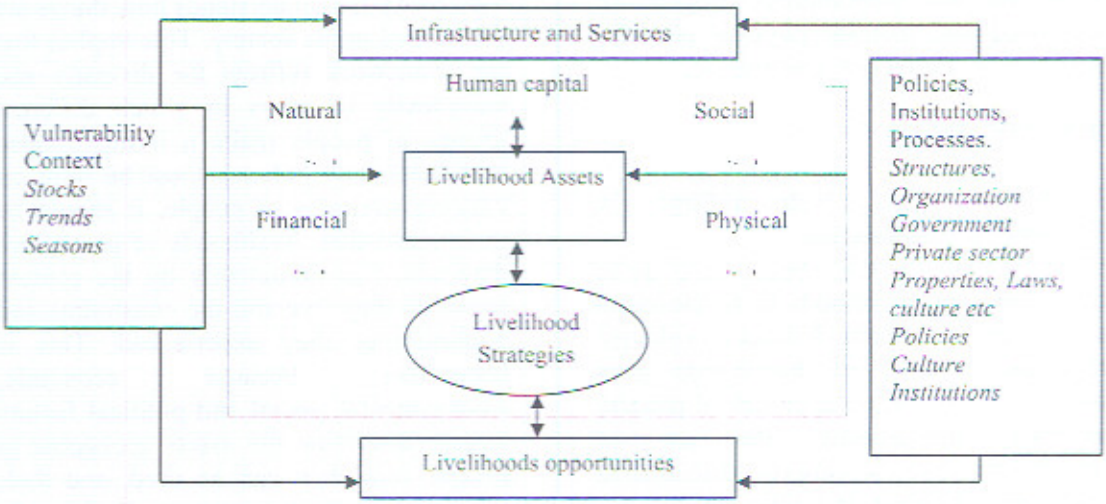
Over the years there has being rapid use of the concept of livelihoods in development studies and practices. Scholars explained that the concept of livelihoods goes beyond money-metric approach to poverty analysis. Interestingly, the use of livelihoods in socio-economic discourse is appealing, because it captures dynamic, historical and rational processes that inform diverse ways in which people make a living and build their worlds [*Chambers*, 1995; *Rokordi, et al.* 2002]. Carney 1993, cited in Info Resources Focus [2004] viewed livelihoods as:

"Capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base"

Related to this notion, *Booth, et al.* [2000] explained that livelihood framework was developed as a result of widespread dissatisfaction with consumption/income approach in the analysis of rural poverty, and what needs to be done about it. *Rakordi, et al.* [2002] however posited that the livelihood framework offers an integrated approach for thinking about access to resources. It recognizes the social asymmetries and relations of power, and a vital proxy that understands how things are distributed in the society. This implies that the framework reflects the diversity and complexity of ways in which different groups of people make a living. It also highlights how policies must be built on existing strengths of people. It should be understood that, livelihoods of people are determined predominantly by the context in which they live and the constraints and opportunities they experienced. This is imperative because economic, environmental, social and political factors largely determine the assets accessible to people, how they can be used, and their ability to obtain secure livelihoods. Interestingly, scholars emphasized that livelihood strategies entails, changing expenditure patterns, reducing overall consumption, changes in family diet, increased indebtedness and a rise in self-production of food, shelter, child care and health care. Indeed, there are generally five forms of livelihood assets identified in most approaches (see figure.1): natural capital; social-political capital; human capital; physical capital and financial capital.

Thus, conceptualization of livelihood within the context of climate change gives a better insight into how changes in climatic condition are related to poverty issues, and it reveals the importance of assets towards liberating people, particularly the poor from the shackle of poverty. It elucidates the importance of human capabilities, material, natural resources, financial capital and credit, political factor/policies towards sustained production activities.

Figure 1. A Livelihood Framework



Source: Adapted from *Rakordi et al.* [2002]

RESULT AND DISCUSSION

Vulnerability

Vulnerability is an analytical concept use for describing susceptibility to harm. It entails the state of powerlessness and marginality of both physical and social systems for guiding normative analysis of actions to enhance well-being through reduction of risk [*Adger*, 2006]. The central idea of the *IPCC* definition is that vulnerability is the degree to which a system is susceptible to and is unable to cope with adverse effects of climate change [*McCarthy, et al.* 2001]. Stem on this notion, the key parameters of vulnerability are the stress to which a system is exposed, its sensitivity, and its adaptive capacity [*Adger*, 2006]. Application of the concept of vulnerability in climate change discourse shed light to shocks and stresses experienced by affected elements, responses and the capacity for adaptive or coping actions involved. *Laurentius*, [1994] described vulnerability "*as susceptibility for rare, though big, risks, while the victims can hardly change the course of events and contribute little or nothing to recovery*". With reference to climate change, vulnerability is susceptibility to climate incidents that can result in considerable reductions in environmental value and serviceability of live sustaining factors of the society. It should be mentioned that, these incidents may be more or less predictable, caused voluntarily or involuntarily, by man's activities or nature. It is equally imperative to note that, vulnerability to climate change does not exist in isolation from the wider socio-political economy of the society. It is driven by human actions that reinforce self-interest and distribution of resources. Vulnerability is most often conceptualized as being constituted by components that include exposure and sensitivity to perturbations or external stresses, and the capacity to adapt. Exposure in this regards refers to the nature and degree to which a system experiences environmental or socio-political stress. More importantly, adaptive capacity is the ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope.

According to *Wratten*, [1995], vulnerability is a concept used to describe household's position relative to poverty and economic stress. It is determined by

households and societal resource characteristics (economic, political, social, demographic, psychological, transportation and environmental). Similarly, Chambers, [1989; 1995] reiterated that the concept comprises both external (exposure to shocks, stress, and risk) and internal sides (defencelessness, in the sense of lack of means to cope without damaging or loss). Interestingly, *Moser*, [1996] defines vulnerability as insecurity and sensitivity in the well-being of individuals, households, and communities in the face of a changing environment, and implicit in this, their responsiveness and resilience to risks that they face during such negative changes. Similar to this notion, The World Food Programme (*WFP*) viewed the concept as a function of exposure to risk and inability to cope. *Adger*, [2006] and *Berdica*, [2002] pointed to the fact that vulnerability captures not only the poor in the present time, but also those who are likely to be at risk of economic, social, policy and institutional failure in the future should stress or shock hit them. It is pertinent to note that, an individual is vulnerable if he/she is particularly expose to adverse external events or shocks and cannot make necessary adjustments to protect him/herself. Vulnerability therefore refers to a condition of living that is detrimental to the psychological condition of individual's communities and several groups [*Moser*, 1996; *Mani*, 2001].

Mani, [2001] and *Marieke*, [2007] identified three fundamental ways to understand the concept of vulnerability in cities; (i) Protection (ii) Capability (iii) Fragility. The first dimension refers to personal functional incapacities. The second dimension concerns household resources and the way these resources can be used to compensate for the negative effects of individual limitations. The availability of a partner and an adequate income constitute the most important household resources. The third dimension refers to the adequacy of the social and physical environment in which people lives, and the way local environment compensates individual's functional limitations and lack of resources within the household.

Climate Change: Why it cannot be neglected

Climate change is a peculiar issue that is related to economic, social, cultural and physical environment of any nation. It is one of the most contending environmental issues strangulating the earth's ecosystems and human livelihood in general. Its impact does not only exacerbate poverty, but it impedes the process of development, particularly in developing countries. These effects among others include; breakdown of infrastructure, environmental and resources destruction, lost of lives and properties, increase poverty and inequality gap.

Climate change defies a precise description but generally it is seen as a prolonged change in weather conditions of the globe as one entity [*David*, 2007]. The weather conditions include all elements that are associated with weather such as temperature, wind patterns and rainfall. The United Nations Framework Convention on Climate Change (*UNFCCC*) defines climate change as a change of climate which is attributable directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over a comparable time periods [*IPCC*, 2001 cited in *Odjugo*, 2009]. Climate change can also be viewed as a long-term shift, alteration or change in the type of climate prevailing over specific location, region or the entire planet [*Ayoade*, 2004]. *Odjugo*, [2009] posited that human factors (industrialization, technology development, urbanization, deforestation and burning fossil etc) and natural factors (solar radiation quality and quantity, astronomical position of the earth) are notable causes of climate

change. It should be ascertained that, climate change manifest in a number of ways; among these are, changes in average climatic conditions; changes in climate variability; changes in frequency and magnitude of extreme weather events and changes in sea levels [*African Institute of Applied Economics*, 2009].

It is imperative to note that, climate change plays a fundamental role in shaping natural ecosystem, social, economic and physical systems that depends on it. For instance, rising temperature may result to changes in weather which could be disastrous and have unpredictable social, economic and environmental consequences. It is important to note that life sustaining systems depends on climate, hence a change in climate affects many related aspects of the economic, social and physical structure. For instance, *Adebo, et al.* [2011] explained that in the short-term, climate change is anticipated to impact freshwater fisheries through incremental changes in water temperature, nutrient levels and lower dry season water levels. In recent time, climate change is increasingly making weather less predictable, rains more uncertain and heavy storm rainfalls more likely. It also manifest in an indirect way to aggravate urban flooding and destruction of infrastructure. Climate change has forced many city dwellers, particularly the poor to live in hazardous places, building their homes and growing their food on flood plains. According to *ActionAid*, [2006] climate change affects global and local economics, through different alteration of changes in demand and supply for goods and services that have cost implications on the society. The frequent occurrence of climate tragedies such as flood, result into soil erosion, destruction of infrastructure, decrease in agricultural productivity, which consequently leads to food shortage, increase expenditure on relief and reconstruction, pollution control etc. Climate change can also influence consumer behavior thus determines the sustenance of companies. It may affect water supply, ecosystem goods and services, energy provision, industry and services in cities around the world. It can disrupt local economies and strip populations of their assets, in some cases leading to mass migration. It is worth mentioning that, impacts of climate change are unlikely to be evenly spread among regions, cities and across sectors of the economy or among socio-economic groups.

It goes beyond doubt that climate change have continuously disrupts the social fabric of cities and exacerbates poverty particularly in most developing countries, including Nigeria. It have reduce poor people's assets, and increased climate variability will increase their vulnerability and undermine their resilience and coping ability. Thus, climate variability and change present a fundamental challenge to the long-term development prospects of many developing countries, and will make it difficult to meet and sustain the Millennium Development Goals (*MDGs*). Interestingly, *UNFCCC*, [2007] explained the interplay between climate change and achievement of the Millennium Development Goals in different regions (table 1). *Fankhauser*, [2009] posit that the total burden of climate change consists of three elements:

1. Costs of mitigation (reducing the extent of climate change);
2. Costs of adaptation (reducing the impact of change) and
3. Residual impacts that can be neither mitigated nor adapted to.

It is important to mention that if well managed, climate change may have positive impact on the socio-economic development of any society. The areas of benefits include;

1. Increase tourist potentials
2. Boost of soil fertility due to periodic flooding
3. Improvement of agriculture sector

4. Enhanced source of electric power due to filled of dams from the rain water.

Countries in Sub-Saharan Africa, including Nigeria, are likely to suffer the most because of their geographical location, low incomes, and low institutional capacity, as well as their greater reliance on climate-sensitive renewable natural resources sectors like agriculture. The impacts of climate change on agriculture are projected to manifest through changes in land and water regimes, specifically, changes in the frequency and intensity of droughts, flooding, water shortages, worsening soil conditions, desertification, disease and pest outbreaks on crops and livestock [*African Institute of Applied Economics*, 2009].

Table 1. Impacts of Climate Change on the Millennium Development Goals

Millennium Development Goal	Potential impacts of climate change
Goal 1 Eradicate extreme poverty and hunger	– Damage to livelihood assets, including homes, water supply, health, and infrastructure, can undermine peoples' ability to earn a living; – Reduction of crop yields affects food security; – Changes in natural systems and resources, infrastructure and labour productivity may reduce income opportunities and affect economic growth; – Social tensions over resource use can lead to conflict, destabilising lives and livelihoods and forcing communities to migrate.
Goal 2 Achieve universal primary education	– Loss of livelihood assets and natural disasters reduce opportunities for full time education, more children (especially girls) are likely to be taken out of school to help fetch water, earn an income or care for ill family members; – Malnourishment and illness reduces school attendance and the ability of children to learn when they are in class; – Displacement and migration can reduce access to education.
Goal 3 Promote gender equality and empower women	– Exacerbation of gender inequality as women depend more on the natural environment for their livelihoods, including agricultural production. This may lead to increasingly poor health and less time to engage in decision making and earning additional income; – Women and girls are typically the ones to care for the home and fetch water, fodder, firewood, and often food. During times of climate stress, they must cope with fewer resources and a greater workload; – Female headed households with few assets are particularly affected by climate related disasters.
Goal 4 Reduce child mortality	– Deaths and illness due to heat-waves, floods, droughts and hurricanes; – Children and pregnant women are particularly susceptible to vector-borne diseases (e.g. malaria and dengue fever) and water-borne diseases (e.g. cholera and dysentery) which may increase and/or spread to new areas – e.g. anaemia resulting from malaria is currently responsible for one quarter of maternal mortality;
Goal 5 Improve Maternal Health	– Reduction in the quality and quantity of drinking water exacerbates malnutrition especially among children; – Natural disasters affect food security leading to increased malnutrition and famine, particularly in sub-Saharan Africa.
Goal 6 Combat HIV/AIDS, malaria and other diseases	– Water stress and warmer conditions encourage disease; – Households affected by AIDS have lower livelihood assets, and malnutrition accelerates the negative effects of the disease.

Goal 7 Ensure environmental sustainability	– Alterations and possible irreversible damage in the quality and productivity of ecosystems and natural resources; – Decrease in biodiversity and worsening of existing environmental degradation; – Alterations in ecosystem-human interfaces and interactions lead to loss of biodiversity and loss of basic support systems for the livelihood of many people, particularly in Africa.
Goal 8 Develop a global partnership for development	– Climate change is a global issue and a global challenge: responses require global cooperation, especially to help developing countries adapt to the adverse effects of climate change; – International relations may be strained by climate impacts.

Source: National communications of non-Annex I Parties and *UNFCCC* Sixth compilation and synthesis of initial national communications from Parties not included in Annex I to the Convention.

It is disheartening to note that, most developing countries find it difficult to provide in advance resilient and adaptation measures that will cater for the global climate change. They are unable to manage natural and human resources towards ameliorating the impact of climate change. Meanwhile, adaptation according to *Mani, et al.* [2008] entails efforts to adjust to ongoing and potential effects of climate change. Adaptation within the realm of climate change include actions taken by people in response to, or in anticipation of changing climate conditions in order to reduce adverse impacts or take advantage of any opportunities that may arise *Nzeadibe, et al.* [2011]. Meanwhile, the need for, type and scale of adaptation depends on the kind of change taking place, as well as the vulnerability of people and natural systems to this change.

Vulnerable countries like Nigeria needs to take the issues of climate change impacts as a matter of urgency. This was base on the fact that the country's is highly vulnerable due to its long (800km) coastline that is prone to sea-level rise and the risk of fierce storms [*Apata,* 2006]. Also, about 2/3 of Nigeria's land cover is prone to drought and desertification, and the country's water resources are extremely under threat which will resultantly affect the sources of energy (Kainji and Shiroro dams) [*IPCC* 2007; NEST 2004 cited in *Apata*, 2006].

Turning the Wheel Round through Good Governance

The ultimate goal of any credible and legitimate government is to ensure sustainable improvement in standard of living and the general livelihood of the citizenry. In other words, provision of adequate and reliable infrastructure and services is necessary to sustain the livelihood of the people. Based on this fact, governance is an unavoidable issue in the discourse of climate change and sustainable livelihood. This stem on the pivotal roles of government in city development, particularly the creation of livable cities. In most developing countries, the problem of providing sustainable environment for living and working have been intensified in recent time, but surprisingly, climate change have become an inevitable clog in the wheel of sustainable development. In recent time, Nigerian cities in particular experienced displeasing situations, courtesy of global climate change and inappropriate preparedness.

Paproski, [1993] viewed governance as the process of interaction between public sector and various actors or groups of actors in 'civil society'. The Oxford Dictionary, explained that governance entails "the act or manner of governing, of

exercising control or authority over the actions of subjects; a system of regulations". Meanwhile, the World Bank, [1992] defined governance as "the manner in which power is exercised in the management of a country's economic and social resources for development". With reference to climate change, governance has become important; because global climate change and poor adaptation capacity has become a powerful force or poison in food basket of most developing countries, including Nigeria. The interest in climate governance for developing countries stems from the need for all those involved in environmental development and management to rethink and fine-tune ways of harnessing the impacts of climate change towards improving the quality of life of the people. It is however painful to note that, poor governance in most developing countries like Nigeria have destroyed the social and economic fabrics. Apart from aggressive corrupt practices, poor state of infrastructural facilities and stressful public policies impact on the livelihood of the people, particularly the poor.

Developing countries however unfolded information to *UNFCCC* on their vulnerabilities to climate change in different sectors. The main sectoral adaptation options and responses adapt to climate change in different sectors are provided in table 2. These include reactive and anticipatory responses. Reactive responses are those which are implemented as a response to an already (immediate) observed climate impact, whereas anticipatory responses are those that aim to reduce exposure to future risks posed by climate change *UNFCCC*, [2007]. Examining the need for governance in societal development, Aristotle emphasized that: *"man needs society, and governments are introduced for the sole purpose of promoting societal good, if government does otherwise, it is a government of armed robbers"*. Interestingly, infrastructure development is generally considered as an important determinant for economic development, and a priority for public and private investment. Thus, the quality of infrastructure services directly determines the quality of life for communities and their levels of productivity. In other words, it may enhance productivity and likewise, if found in poor state, it will retard productivity and sap the production costs.

Table 2. Adaptation measures in key vulnerable sectors highlighted in national communications of developing countries

Vulnerable sectors	Reactive adaptation	Anticipatory adaptation
Water Resources	– Protection of groundwater resources – Improved management and maintenance of existing water supply systems – Protection of water catchment areas – Improved water supply – Groundwater and rainwater harvesting and desalination	– Better use of recycled water – Conservation of water catchment areas – Improved system of water management – Water policy reform including pricing and irrigation policies – Development of flood controls and drought monitoring
Agriculture and food security	– Erosion control – Dam construction for irrigation – Changes in fertilizer use and application – Introduction of new crops – Soil fertility maintenance – Changes in planting and harvesting times	– Development of tolerant/resistant crops (to drought, salt, insect/pests) – Research and development – Soil-water management – Diversification and intensification of food and plantation crops

	– Switch to different cultivars – Educational and outreach programmes on conservation and management of soil and water	– Policy measures, tax incentives/subsidies, free market – Development of early warning systems
Human health	– Public health management reform – Improved housing and living conditions – Improved emergency response	– Development of early warning system – Better and/or improved disease/vector surveillance and monitoring – Improvement of environmental quality – Changes in urban and housing design
Terrestrial ecosystems	– Improvement of management systems including control of deforestation, reforestation and afforestation – Promoting agroforestry to improve forest goods and services – Development/improvement of national forest fire management plans – Improvement of carbon storage in forests	– Creation of parks/reserves, protected areas and biodiversity corridors – Identification/development of species resistant to climate change – Better assessment of the vulnerability of ecosystems – Monitoring of species – Development and maintenance of seed banks – Including socioeconomic factors in management policy
Coastal zones and marine ecosystems	– Protection of economic infrastructure – Public awareness to enhance protection of coastal and marine ecosystems – Building sea walls and beach reinforcement – Protection and conservation of coral reefs, mangroves, sea grass and littoral vegetation	– Integrated coastal zone management – Better coastal planning and zoning – Development of legislation for coastal protection – Research and monitoring of coasts and coastal ecosystems

Source: National communications of non-Annex I Parties and *UNFCCC* Sixth compilation and synthesis of initial national communications from Parties not included in Annex I to the Convention.

It is imperative to mention that, infrastructure services cut across the provision of piped borne water, electricity/power, health services, transportation, waste management, drainages, etc. Unfortunately, alarming rate of urbanization and poor governance contributes towards increasing climatic risk in most Nigerian cities. Scholars have noted that rapid rate of uncontrolled and unplanned urbanization in the country has however brought with it complex problems or strains of old and poorly designed infrastructural facilities. The *UNCHS/UNEP*, [1997] identified critical environment-development issues in notable traditional city of Nigeria, Ibadan:

1. Inadequate provision and management of environmental infrastructure-unrepaired water pipes, inability to generate sufficient funds, erratic power supply, and poor management have prevented over half of Ibadan's residents from having access to potable water, with attendant health and economic problems.

2. Insufficient waste management services- a low solid waste collection rate has resulted in illegal dumping, blocked drains,

disruption of business in commercial areas, reduced road space, and localized air pollution due to neighbourhood incineration.

3. Flooding exacerbated by uncontrolled urbanization- much of the city has no storm water drains, sewers or gutters. This lack of drainage, combined with shallow valley floors, increasing impermeabilisation and poor solid waste management, has resulted in at least ten devastating floods in the last 70 years. These are worsened by settlement in floodplains and deforestation of hillsides.

4. Poor environmental health arising from inadequate water supply, water pollution, poor refuse disposal, crowded and sub-standard housing, contaminated food, and disasters such as flooding have resulted in high health risks for Ibadan residents.

Governments typically have a large and diverse range of responsibilities with regard to built environment, infrastructure and services that are germane to adaptation to climate change. *Satterthwaite, et al.* [2010] explained that urban governments should have a key role as risk reducers for climate change:

1. Providing infrastructure and services (perhaps with some of it contracted to private enterprises or non-governmental organizations;

2. guiding where development takes place-for instance, influencing where urban settlements develop and where they do not, and what provision there is to avoid floods, fires, etc.;

3. regulating building design and construction (including support and training builders, especially those who are active in building within low-income settlements);

4. regulating hazardous activities that can produce disasters (including industries and transport);

5. influencing land availability (through landuse regulations, zoning and official procedures for buying or obtaining land and what can be built on it)-the quality of landuse management influences the proportion of poorer groups having to live on hazardous or disaster-prone sites;

6. encouraging and supporting household/community action that reduces risk (e.g better-quality housing, safer sites, good infrastructure and good disaster preparedness), including support for community-based adaptation;

7. providing law and order which should also act to protect low-income groups from risks; and

8. coordinating and supporting links between protection (disaster avoidance), disaster preparedness and post-disaster response and rebuilding-for instance, ensuring that all the task above integrate with agencies responsible for disaster preparedness and response.

Good governance is like blood that flows in the vein of human being, and it is essentially about improving people's livelihood and opportunities. It is therefore an inevitable element in the drive to liberate people from shackle of poverty, and facilitate possibilities of attaining sustainable livelihoods. Good environmental or climate change governance is therefore a complex and dynamic process that lies within the realm of the country's standard of governance, customs, econo-

mics, politics and global economy development. Thus, involvement of government in environmental development, particularly climate change are driven by internal pressures on environmental resources, environmental threats, growing population and the focus of international community on poverty alleviation and socio-economic development, especially the Millennium Development Goals.

CONCLUSION

Scholars expatiate that adaptation in the context of climate change refers to any adjustment in natural or human systems in response to actual or expected impacts of climate change aimed at moderating harm or exploiting beneficial opportunities. It was also emphasized that adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Adaptation is the ability to respond and adjust to actual or potential impacts of changing climate conditions in ways that moderate harm or takes advantage of any positive opportunities that the climate may afford. It includes policies and measures to reduce exposure to climate variability and extremes, and the strengthening of adaptive capacity.

Nigeria for instance needs to take the issues of climate change impacts as a matter of urgency. This was base on the fact that the country's is highly vulnerable due to its long (800km) coastline that is prone to sea-level rise and the risk of fierce storms [*Apata*, 2006]. Also, about 2/3 of Nigeria's land cover is prone to drought and desertification, and the country's water resources are extremely under threat which will resultantly affect the sources of energy (Kainji and Shiroro dams) [*IPCC* 2007; *NEST* 2004 cited in *Apata*, 2006]. It is imperative to elaborate that good environmental governance is not expected to discriminate among people in the society. This is partly based on the fact that the impact of environmental mishaps will directly or indirectly affect the general populace. Thus, decisions on the provision of adaptation measures should involve all stakeholders representing various interest groups in the society (promote participatory approach). It implies bottom-up decision – making; having all concerned people at every level of government and non-government organizations participate. In the discourse of climate change and livelihoods, good governance becomes a function of not merely efficient management, but also of the quality of civic engagement in the processes and structures of governance. It should revolve around the indicators of good governance (Participation; transparency; effectiveness; equity; responsiveness; accountability; decentralization). Communities need to put in place adequate resilience, including adopting appropriate technologies while making the most of traditional knowledge, and diversifying their livelihoods to cope with current and future climate stress. There is also need to integrate local coping strategies and traditional knowledge with governments' interventions. It should be understood that, local or national condition will determine the choice of adaptation interventions. More importantly, collaboration between different stakeholders should be effectively harnessed for meaningful and effective measures of adaptation. Nevertheless, relevant ministries, agencies, organizations, governments and non-governmental institutions should not only be involved through funding of compensation or relief materials after disasters, but they need to recognize the impact of climate change and integrate climate change issues in various policies and decision making, particularly planning and budgeting.

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